

APR 23 2010

Appl. No. 10/783,495
Amdt. Dated: 04/23/2010
Resp. to 02/26/2010 Off'l action

Attorney Docket No.: N1085-00251
[TSMC2003-0834]

REMARKS/ARGUMENTS

Claims 1 and 3-22 are pending in this application and each was rejected in the subject final Office action. No claim amendments are filed herein. Applicants respectfully request re-examination, reconsideration and allowance of each of pending
5 claims 1 and 3-22.

I. Claim Rejections

In paragraph 6, **claims 1, 3, 4 and 9-11** were rejected under 35 U.S.C. § 103(a) as being unpatentable over Park, U.S. Patent No. 6,825,912 in view of U.S. Patent No. 6,630,362 to Lensing, hereinafter "Lensing" and further in view of Applicants'
10 Admitted Prior Art (hereinafter "AAPA"). In paragraph 13, **claims 5-8 and 12-22** were rejected under 35 U.S.C. § 103(a) as being unpatentable over Park in view of Lensing and in further view of U.S. Patent No. 6,798,529 to Saka, et al. (hereinafter "Saka").

Applicants respectfully submit that each of these claim rejections is overcome for reasons set forth below.

15 First and foremost, each of independent claims 1 and 12 is believed distinguished from Park in view of Lensing because:

a) one would absolutely not combine the teachings of Park with the teachings of Lensing to produce the claimed invention as proposed by the Examiner; and

20 b) even if one were to attempt to combine the references, the claimed invention would not result.

The Park reference is completely focused on and limited to addressing the exposure time in a photolithographic operation. In fact, the Park reference is titled: SYSTEM FOR ADJUSTING A PHOTO-EXPOSURE TIME. As clearly set forth in the
25 title, the stated and only objective of the Park reference is to adjust exposure time, not exposure energy. Park addresses a challenge and a problem of the semiconductor manufacturing industry, the need to provide proper expose settings during

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photolithographic patterning operations used to pattern semiconductor devices. The Park reference provides one approach to solving this problem: adjusting the exposure time. Regardless of the parameter Park measures or the technological aspect Park considers, Park's approach to addressing this issue of providing correct exposure conditions is one and the same: adjusting the exposure time.

The Park reference therefore cannot be used to support an obviousness rejection based on modifying the Park reference to change the exposure energy, as such would at least be counterintuitive. Moreover, Applicants submit that Park teaches away from changing exposure energy as his entire disclosure is directed to *precluding the need to alter or control exposure energy*. Generally speaking, if a reference states a problem in a particular technology and the entire reference is directed to solving the problem in one particular manner, one would not, based on the reference, use a different approach because then one would not be relying upon the reference at all. In particular, if one of ordinary skill in the semiconductor manufacturing art, was considering aspects of the Park reference to control exposure time and, INSTEAD, decided to control the exposure energy, the Park reference would no longer be applicable or useful, i.e. one would no longer be relying upon Park, so one would NOT combine the Park reference with a reference directed to altering exposure energy such as Lensing, to produce the claimed invention.

Applicants address the Examiner's reliance upon the Fulton case in the subject Office action. On page 3, the Office action provides:

"[t]he prior art's mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed . . ."
In re Fulton, 391 F.3d 1195, 1201, 73 USPQ2d 1141, 1146 (Fed. Cir. 2004).

Park, however, does discourage the solution claimed and teaches away from the Applicants' invention because Park does not even mention or apparently consider

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changing the exposure energy. Park therefore does teach away from controlling the exposure energy.

Claims 1 and 12 are therefore distinguished from Park and Lensing at least because a) Park is acknowledged not to disclose the claimed invention, b) Lensing is
5 acknowledged not to disclose the claimed invention and c) one would not combine Park with Lensing because Park teaches away from doing so.

Moreover, none of the references, nor any combination thereof, teach or suggest the use of thickness or a thickness variation measurements of one subjacent layer to generate a feed forward signal to control the exposure energy of another top (i.e.,
10 *different*) device layer, in which the top device layer is NOT a photoresist layer, as recited in independent claims 1 and 12.

In each of claims 1 and 12, the top layer is clearly distinguished from the subjacent layer: a subjacent layer beneath a top layer (claim 1); and interlayer layer ... and a top layer (claim 12). In each case, the layer from which the thickness (or
15 thickness variation) reading is taken, is used to control the exposure energy of a different device layer which is disposed above the measured layer, i.e. the "top" layer, and this different "top" layer disposed above the measured layer is a NON-PHOTORESIST layer (henceforth, inherently a device layer). Claims 1 and 12 are therefore clearly distinguished from the scenario in which the "top layer" is photoresist
20 (PR) because photoresist is a photosensitive patterning medium with completely different characteristics than a device layer in photolithographic exposure operations.

Applicants thank the Examiner for conceding, in the Interview Summary mailed September 9, 2009 that the Park and Lensing references together, do not teach the combination of features including the top layer being a non-PR layer, as above. In
25 particular, the September 9, 2009 Interview Summary states that: *The Examiner agreed the newly presented amendments of "the top layer being a non-photoresist*

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layer" in claim 1 and "the top layer being a non-photoresist layer" in claim 12 appears to overcome the prior art of Park and Lensing.

The Examiner now relies upon the Applicants' Admitted Prior Art for providing this top layer being a non-PR layer feature of claim 1. In particular, the Office action
5 concedes that:

Lensing does not expressly teach a top layer being a non-photoresist layer,

then alleges:

10 *Applicant acknowledges "that for virtually every semiconductor processing sequence, there are multiple times when the top layer of the substrate being processed is not a photoresist layer." (See Remarks, pg. 9, paragraph 4 filed on 09 December 2009 and MPEP2129 [R-6]).*

While Applicants concede that there are, indeed, many times when the top layer
15 of a substrate being processed is not a photoresist layer, the action's reliance upon Applicants' statement is misplaced.

While it is true that semiconductor substrates "exist" in this condition during processing, there is certainly no suggestion by ANY reference that addresses photolithography, that a non-photoresist layer could be interchanged with a photoresist
20 layer in photolithography processing because a photoresist layer is a photolithographically sensitive layer and other device layers are not. The AAPA certainly does not teach this. There are basic, fundamental, and prominent distinctions between a PR layer and a non-photolithographically sensitive layer in the arena of device patterning. It is inherent and uncontroverted that a photolithographic operation
25 carried out upon a photoresist cannot similarly be carried out upon another layer. The AAPA certainly does not suggest that PR and non-PR layers are interchangeable, as apparently implied in the Office action. The fact that a photoresist layer can be exposed to a particular wavelength of light to break up cross-linked polymeric materials and

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render them dissolvable in a developer, does not suggest that the same wavelength of radiation could be directed to a silicon or other device layer and render the layer dissolvable by the same developer.

Applicants respectfully submit that no one of ordinary skill in the art would read the AAPA to suggest that a non-photoresist layer of the invention could replace the photoresist layer of Park or Lensing. Rather, the significance of claims 1 and 12 reciting that the top layer is a non-photoresist layer, is to point out that there are two device layers and that the thickness (claim 1) or thickness variation (claim 12) of a subjacent one of the device layers is used to control the exposure energy used in patterning the other, upper device layer. As known to a person having ordinary skill in the art, the patterning of the top device layer would necessarily be carried out by forming a photosensitive film over that top layer (although this is not part of either of the claims). In contrast, Park merely provides for using the thickness of the device layer being patterned with a photoresist layer, to influence the patterning of that same device layer.

In summary, one would not combine Park with Lensing to yield an invention that controls exposure energy and neither reference teaches using the thickness of one subjacent layer to control the exposure energy used in patterning a top non-photoresist layer. Furthermore, Applicants' statement that the top layer is often a non-photoresist layer does not suggest that a top-non-photoresist layer could replace a photoresist layer in a photolithography operation and produce any semblance of the same results.

Further distinguishing claims 1 and 12 from Park, Lensing and the AAPA, the recitation of the top layer being a non-photoresist layer also requires that there is not a photoresist layer on top of the structure recited in claims 1 and 12. (It is notoriously well known that a photoresist layer would not be used under a device layer on a product and therefore inherent that the top layer being a non-photoresist layer also requires that there is no photoresist layer at all on the substrate). Each of claims 1 and 12 recites controlling the exposure energy with a feedback process control signal of critical

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dimension and the critical dimension therefore cannot be the critical dimension of a photoresist layer.

Park, in sharp contrast, requires the critical dimension to be a critical dimension of the photoresist layer, further distinguishing Applicants' invention. An examination of
5 Park reveals that the section of Park that was cited for providing critical dimensions, namely, column 5, lines 35-50 is limited to critical dimensions of the photoresist layer only. This portion of Park refers only to "ADI step 30". ADI is known to mean After-Development-Inspect and is necessarily carried out after the photoresist layer is developed and before it is removed. The readings, i.e., the critical dimensions, are
10 necessarily limited to being the critical dimensions of the photoresist layer. In each of claims 1 and 12, Applicants' invention recites a critical dimension that can NOT be a critical dimension of a photoresist layer.

Claims 1 and 12 are therefore further distinguished from Park in view of Lensing and the AAPA.

15 Claims 3, 4 and 9-11 depend from independent claim 1 and are therefore also distinguished from Park in view of Lensing and the AAPA. The rejection of claims 1, 3, 4 and 9-11 under 35 U.S.C. § 103(a), should therefore be withdrawn.

20 With respect to claims 5-8 and 12-22, Saka has apparently been relied upon for teaching measurement of thickness remaining of an interlayer after chemical mechanical planarization thereof. Saka does not make up for the above-stated deficiencies of Park and Lensing rendering independent claim 1 distinguished from the combination of Park, Lensing and Saka. Claims 5-8 are similarly distinguished by virtue of their dependencies from claim 1 and therefore the rejection of claims 5-8 under 35 U.S.C. § 103(a), should be withdrawn.

25 With respect to independent claim 12, Saka has apparently also been relied upon for providing CD measurement of a second manufacturing lot. Applicants respectfully submit that Saka does not a) make up for the above-stated deficiencies of the

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combination of the stated references and b) Saka does not even provide the feature upon which it is relied upon. The sections of Saka pointed out on page 12, fourth paragraph of the Office action, do not refer to processing of subsequent lots of material, but rather to *successive wafers of a lot*.

5 At any rate, Saka does not make up for the above-stated deficiencies of Park and Lensing and because independent claim 12 is distinguished from Park, Lensing (and the AAPA), claim 12's dependent claims – claims 13-22 – are also distinguished from the combination of references.

10 As such, the rejection of claims 12-22 under 35 U.S.C. § 103(a), should be withdrawn.

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CONCLUSION

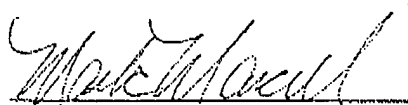
Based on the foregoing, each of pending claims 1 and 3-22 is in allowable form and the application in condition for allowance, which action is respectfully and expeditiously requested.

5 The Assistant Commissioner for Patents is hereby authorized to charge any fees necessary to give effect to this filing and to credit any excess payment that may be associated with this communication, to Deposit Account 04-1679.

Respectfully submitted,

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Dated: April 23, 2010


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